

### REMARKS

In reply to the office action of July 13, 2009, Applicants have amended claims 1, 5, 9, 14-16, and 28, canceled claim 12, and added new claims 30 and 31. Accordingly claims 1-11 and 13-31 are pending, with claims 1, 5, and 9 in independent form.

Claims 1, 4, and 9 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Hamakawa et al. (U.S. Patent No. 4,820,915, "Hamakawa"). Further, claims 12-14, 24-27, and 29 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hamakawa. Without conceding the merits of these claim rejections, but instead to expedite prosecution, Applicants have amended claims 1 and 9 in this reply to cover radiation detectors that include "a plurality of functional layers, at least two of said functional layers having different band gaps ... each ... of the functional layers [being] implemented to absorb at least some of the radiation."

Applicants believe that the subject matter of amended claims 1 and 9 is neither disclosed nor suggested by Hamakawa. In particular, Hamakawa provides no teaching regarding the band gaps of the PIN structures in his color sensors. The nature of the band gaps in Hamakawa's color sensors would therefore not have been apparent to a person of ordinary skill in the art, and it cannot be fairly stated that Hamakawa either discloses or suggests an active region of a radiation detector having at least two functional layers with different band gaps.

Accordingly, Applicants submit that claims 1 and 9 are patentable over Hamakawa, and respectfully request reconsideration and withdrawal of the rejections of claims 1 and 9 under 35 U.S.C. § 103(a).

Claim 12 has been canceled. Claims 4, 13-14, and 24-27 depend from one of claims 1 or 9, and are therefore patentable over Hamakawa for at least the same reasons. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 4, 13-14, and 24-27 under 35 U.S.C. §§ 102(b) and 103(a).

Claims 2 and 20 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hamakawa in view of Keller (U.S. Patent No. 5,406,067, "Keller"). Without conceding the merits of the proposed combination of Hamakawa and Keller, Applicants note that claims 2 and 20 depend from claims 1 and 9, respectively, each of which is patentable over Hamakawa as

explained above. Keller does not cure Hamakawa's deficiencies with regard to claims 1 and 9, at least because Keller fails to disclose or suggest radiation detectors with an active region that includes at least two functional layers having different band gaps. Accordingly, claims 1 and 9 are patentable over Hamakawa and Keller, alone or in combination.

For at least the same reasons, claims 2 and 20 are also therefore patentable over Hamakawa and Keller. Therefore, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 2 and 20 under 35 U.S.C. § 103(a).

Claims 3, 5-8, 11, 15-23, and 28 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hamakawa in view of Figueroa et al. (U.S. Patent No. 4,360,246, "Figueroa"). As to independent claim 5, which covers radiation detectors with a semiconductor body that includes "at least one III/V semiconductor material," the Action acknowledges that Hamakawa fails to disclose such a semiconductor body, but relies on Figueroa to provide this teaching, and alleges that it would have been obvious to combine the teachings of Hamakawa and Figueroa (Action at page 9). Applicants respectfully disagree, for at least the following reasons.

In Hamakawa's color sensor, the color of incident light is determined by applying a series of different bias voltages to electrodes 3 and 7 (see, e.g., Fig. 1 of Hamakawa), and measuring photocurrents from the sensor which are related to the wavelength of the incident light (see, e.g., Hamakawa, col. 6, line 3, through col. 7, line 8). For Hamakawa's sensors to function properly (and with requisite sensitivity), the photocurrent generated by the sensors should be a relatively sensitive function of the applied bias voltage and the wavelength of the incident light. If this were not the case, Hamakawa's sensors might not be able to distinguish between different light wavelengths.

Hamakawa's sensor layers are formed of "amorphous silicon" (Hamakawa, col. 2, line 52). Silicon is a semiconductor material with an indirect band gap. A person of ordinary skill in the art would have realized that the absorption coefficient for indirect band gap materials is a relatively strong function of wavelength, and this provides wavelength sensitivity in Hamakawa's color sensors. In fact, Hamakawa states that "an absorption coefficient of

amorphous silicon is exponentially reduced from short to long wavelengths” (Hamakawa, col. 3, lines 12-14). Thus, it appears that Hamakawa’s sensors rely on a strongly wavelength-dependent absorption coefficient – as in a material such as amorphous silicon – to function properly.

Amorphous silicon is not, however, a III/V semiconductor material, as claim 5 requires.

The Action proposes to instead use the GaAs layers taught by Figueroa in Hamakawa’s sensor. But GaAs is a direct band gap material, and a person of ordinary skill in the art would have recognized that direct band gap materials have absorption coefficients above the band gap that are *approximately wavelength independent*. That is, for a direct band gap semiconductor, the absorption coefficient as a function of wavelength is approximately a step function. For incident photons with energies less than the band gap, the absorption coefficient is approximately zero. For incident photons with energies equal to or higher than the band gap, the absorption coefficient is approximately a constant value larger than zero.

In other words, there would have been no reason for a person of ordinary skill in the art to use Figueroa’s GaAs layers in Hamakawa’s sensor, because such layers would likely not provide the strongly wavelength-dependent absorption and photocurrent that the functioning of Hamakawa’s sensors appears to require. The combination contemplated by the Action would likely impair or even destroy the functioning of Hamakawa’s sensor, and a person of ordinary skill in the art would have understood this.

Moreover, claim 5 requires that the radiation detector detects “radiation in accordance with the predefined spectral sensitivity distribution of the human eye.” A person of ordinary skill in the art would understand that the spectral sensitivity distribution of the human eye is appreciable across nearly the entire visible range of the electromagnetic spectrum. But Figueroa’s GaAs materials detect light in the red and/or infrared portions of the spectrum. Figueroa states that such materials “operate at an optical wavelength of about 0.6 to 0.9  $\mu\text{m}$ ” (Figueroa, col. 2, lines 19-20). As such, Figueroa’s GaAs materials are unsuitable for use in a detector that detects radiation in accordance with the predefined spectral sensitivity distribution of the human eye, which necessarily involves detection of radiation at wavelengths smaller than 0.6  $\mu\text{m}$ . A person of ordinary skill in the art would have recognized these

limitations on Figueroa's GaAs materials, and would therefore not have used such materials to construct a detector of the type recited in claim 5.

In view of the foregoing, Applicants submit that a person of ordinary skill in the art would have found no reason to combine Hamakawa and Figueroa in the manner proposed by the Action. Claim 5 is therefore patentable over Hamakawa and Figueroa, and Applicants respectfully request reconsideration and withdrawal of the rejection of claim 5 under 35 U.S.C. § 103(a).

Claims 3, 11, 15-23, and 28 each depend from claim 1 or claim 9. Without conceding or addressing the merits of the proposed combination of Hamakawa and Figueroa, Applicants note that claims 1 and 9 are patentable over Hamakawa, as discussed above. Figueroa does not cure the deficiencies of Hamakawa with regard to claims 1 and 9, at least because Figueroa fails to disclose or suggest radiation detectors with an active region that includes at least two functional layers having different band gaps. Accordingly, claims 1 and 9 are patentable over Hamakawa and Figueroa, alone or in combination.

For at least the same reasons, claims 3, 11, 15-23, and 28 are also patentable over Hamakawa and Figueroa. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 3, 11, 15-23, and 28 under 35 U.S.C. § 103(a).

Claims 6-8 depend from claim 5. Without conceding or addressing the merits of the proposed combination of Hamakawa and Figueroa, Applicants note that claim 5 is patentable over Hamakawa and Figueroa as discussed above because a person of ordinary skill in the art would have found no reason to use GaAs materials in Hamakawa's sensor; such a substitution would almost certainly reduce the accuracy of Hamakawa's sensor, and might even preclude its functioning altogether.

Notwithstanding the Action's arguments regarding claims 6-8 (Action at page 10), these claims are patentable over Hamakawa and Figueroa for at least the same reasons as claim 5. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 6-8 under 35 U.S.C. § 103(a).

New claims 30 and 31 have been added in this reply. The subject matter of these claims is supported, for example, by previous claim 28. Claims 30 and 31 depend from claims 1 and 5, respectively. As discussed previously, claims 1 and 5 are patentable over Hamakawa and Keller or Figueroa, alone or in combination. Claims 30 and 31 are also therefore patentable over Hamakawa and Keller or Figueroa, for at least the same reasons as claims 1 and 5. Applicants therefore believe that claims 30 and 31 are in condition for allowance, and respectfully request notice of same.

In view of the foregoing, Applicants ask that the application be allowed.

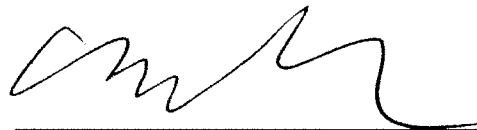
Canceled claims, if any, have been canceled without prejudice or disclaimer. Any circumstance in which Applicants have: (a) addressed certain comments of the Examiner does not mean that Applicants concede other comments of the Examiner; (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims; or (c) amended or canceled a claim does not mean that Applicants concede any of the Examiner's positions with respect to that claim or other claims.

The amount of \$52.00 for excess claims fees are being paid concurrently on the Electronic Filing System (EFS) by way of Deposit Account authorization. Please apply any charges or credits to Deposit Account 06-1050, referencing Attorney Docket No. 12406-0213US1.

Respectfully submitted,

Date:

10/13/09



Marc M. Wefers  
Reg. No. 56,842